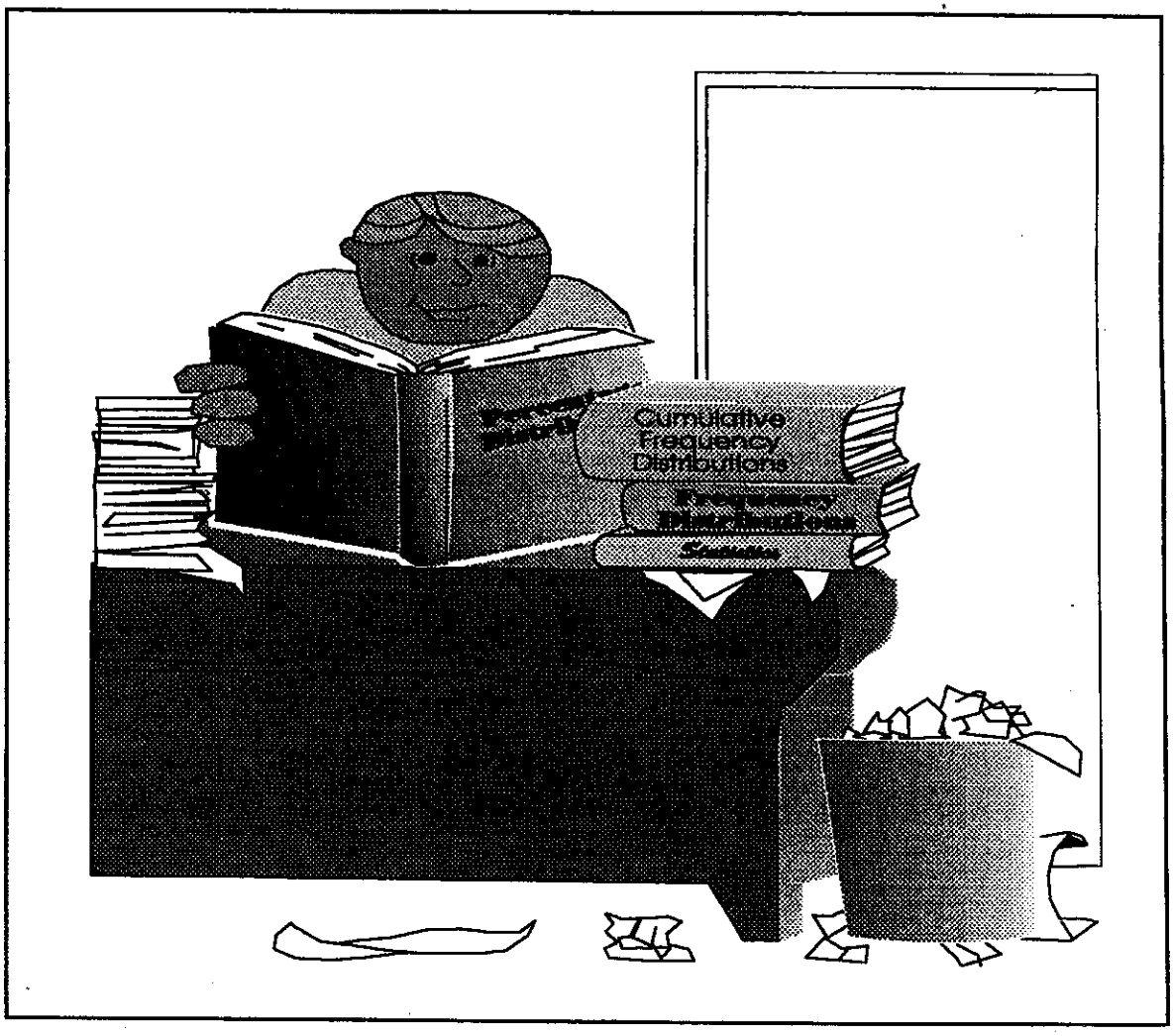
Lesson 5

Percentage Distributions



Questions To Consider

- What are percentage distributions?
- How do you read and create percentage tables and graphs?

Key Terms

- Percentage distribution
- Percentage distribution table
- Percentage histogram
- Percentage polygon
- Relative-frequency distribution
- Relative-frequency distribution table
- Relative-frequency histogram
- Relative-frequency polygon

What Are Percentage Distributions?

By now you're probably wondering how many more lessons are going to be titled Something-or-Other Distribution. Take heart—only this one and one more. The good news is that **percentage distributions**, the subject of this lesson, are virtually the same as plain old frequency distributions, except that they deal with percentages rather than with absolute amounts. As a matter of fact, percentage distributions are also called **relative-frequency distributions**.

Like a frequency distribution, a percentage distribution can be used to present data in a condensed manner. But instead of showing an actual number of occurrences of values within an interval, it shows the occurrences in that interval as a percentage of the total number of occurrences in the set.

Percentage distributions show the occurrences in an interval as a percentage of the total number of occurrences in the set.

Table 5-1 shows the percentage of U.S. households in each of eight income categories from 1975 through 1979.

Table 5-1. Annual Income Of American Households: 1975 To 1979

Income level	Percentage of households				
	1975	1976	1977	1978	1979
Under $5000	19.9	17.8	16.5	14.7	13.2
$ 5,000-$ 9,999	22.4	21.4	20.2	18.4	16.4
$10,000-$14,999	20.5	19.1	18.0	16.6	15.9
$15,000-$19,999	15.9	16.4	15.6	15.3	14.0
$20,000-$24,999	9.6	10.7	11.5	12.2	12.4
$25,000-$34,999	7.8	9.5	11.5	13.8	15.6
$35,000-$49,999	2.7	3.5	4.5	6.0	8.3
$50,000 and over	1.2	1.6	2.2	3.0	4.2

For example, in 1975, 19.9% of all households had annual incomes of under $5,000. In 1978, 6.0% had annual incomes of between $35,000 and $49,999. Note that if you add up the percentages for each income category for 1975 you get 100%. The same is true for the other years.

You can, of course, take the information in a frequency distribution and use it to construct a percentage distribution. Look at the frequency figures in the frequency distribution table below (Table 5-2).

Table 5-2. Pollution Control Engineers Who Received Two Or More Raises Last Year

Age range	Number receiving two or more raises last year
22-28	26
29-35	36
36-42	52
43-49	48
50-56	20
57-63	18

Source: Another case of wishful thinking

You can use the data in this frequency distribution to make a percentage distribution table.

Note that there were a total of 200 engineers surveyed (26 + 36 + 52 + 48 + 20 + 18 = 200). So, to construct a percentage distribution table based on these figures, you just figure out what percentage of the 200 engineers fall into each category. For example, 26 of the 200 fall into the 22-28 age-range category; that's 13% (26/200 = 13/100 = 13%). If you calculate the percentage for each category, you come up with Table 5-3.

Table 5-3. Pollution Control Engineers Who Received Two Or More Raises Last Year

Age range	Percentage of total receiving two or more raises last year
22-28	13
29-35	18
36-42	26
43-49	24
50-56	10
57-63	9

Here's the same idea using air pollution data (Table 5-4):

Table 5-4. SO_2 Concentrations

SO_2 level (ppb)	Frequency	Percentage
Less than 40	4	16
40- 54	7	28
55- 69	4	16
70- 84	4	16
85- 99	2	8
100-114	1	4
115-129	1	4
130-144	0	0
145-159	1	4
160-174	0	0
175-189	1	4

A percentage distribution can be displayed graphically as a **percentage histogram** (also known as a **relative-frequency histogram**). The histogram below (Figure 5-1), which is based on Table 5-3, is constructed in the same manner as were the other histograms that have been discussed.

A percentage histogram is a graphic display of a percentage distribution.

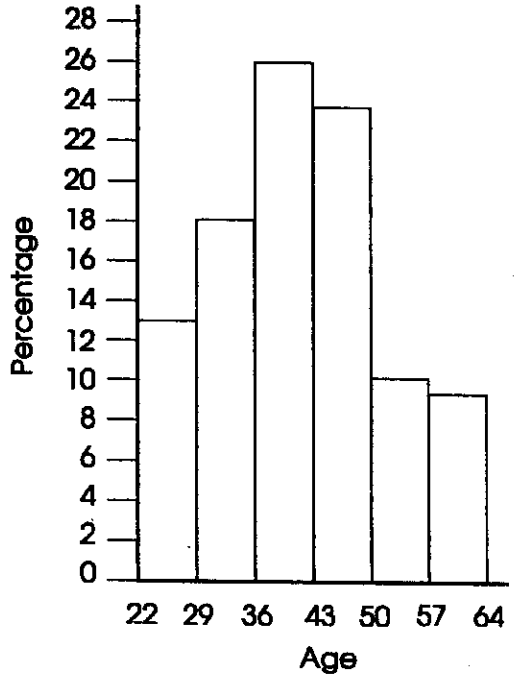


Figure 5-1. Percentage Of Engineers Receiving Two Or More Raises Last Year

You can also construct (Figure 5-2) a **percentage polygon** (or **relative-frequency polygon**) using the same methods that were used to construct a frequency polygon.

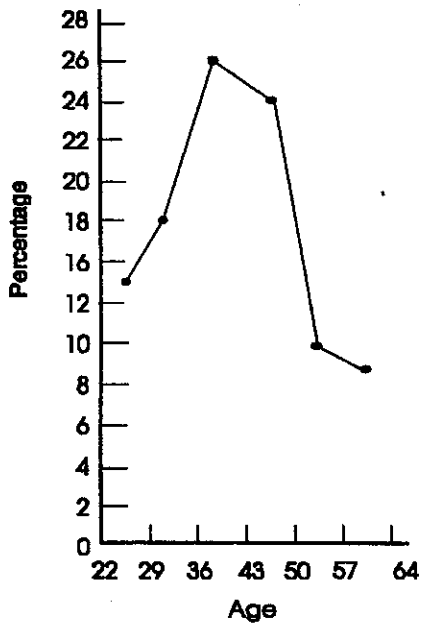
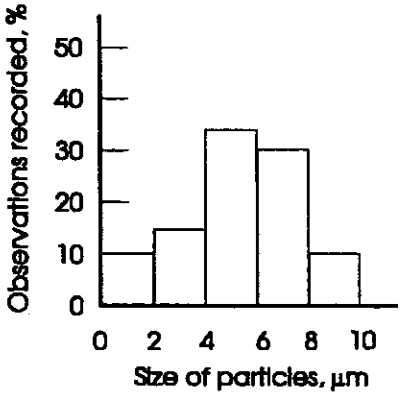


Figure 5-2. Percentage Of Engineers Receiving Two Or More Raises Last Year

As with frequency distribution tables and cumulative frequency distribution tables and their corresponding histograms and polygons, you can create a **percentage distribution table** or relative-frequency distribution table from a percentage histogram or a **percentage polygon**.

Use the percentage histogram below (Figure 5-3) to construct a percentage distribution table in Table 5-5.



You can use the data from this percentage histogram to create a percentage distribution table.

Figure 5-3. Percentage Histogram For Do-It-Yourself Percentage Distribution Table

Table 5-5. Do-It-Yourself Percentage Distribution Table

Size of particles (µm)	Observations recorded (%)

Your percentage distribution table should look something like Table 5-5a on the next page.

Table 5-5a. Do-It-Yourself Percentage Distribution Table (answer)

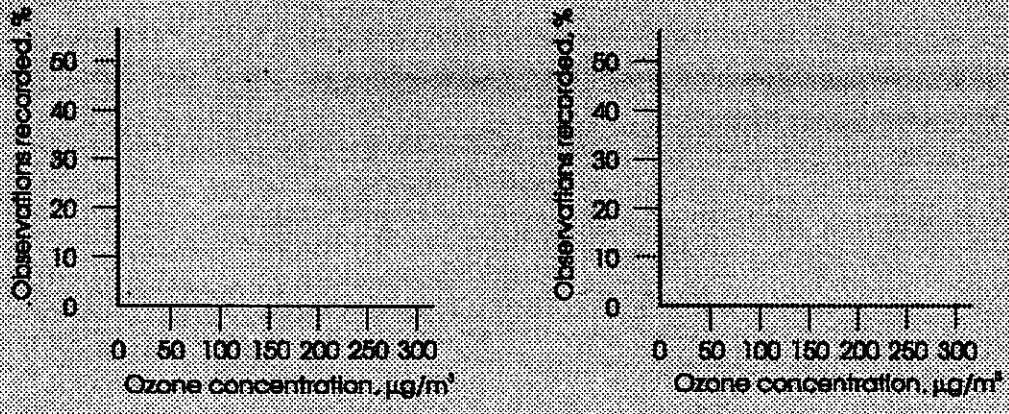
Size of particles (μm)	Observations recorded (%)
0-2	10
2-4	15
4-6	35
6-8	30
8-10	10

Now that you know the basics of percentage distributions, try your hand at these exercises (solutions are on the next page):

1. **What is a percentage distribution?**

2. **Use the percentage distribution shown in the table below to construct a percentage histogram and a relative-frequency (or percentage) polygon.**

Ozone concentration ($\mu g/m^3$)	Observations recorded (%)
0- 49.9	2
50- 99.9	36
100-149.9	24
150-199.9	22
200-249.9	10
250-299.9	6



Solutions

1. A percentage distribution is a distribution that show relative frequencies rather than actual counts. For each category (individual or group), it shows the ratio of occurrences in that group to the total number of occurrences recorded.

2.